The same product is formed on treating the acid with phosphorus trichloride. Methylstannichloroform crystallises from light petroleum in long colourless prisms melting at 105—107° and distils without decomposition at 179—180°. It fumes in the air, dissolves to a clear solution in water, and is very soluble in the ordinary organic solvents.

"On the Photo-electric Discharge from Metallic Surfaces in different Gases." By W. MANSERGH VARLEY, M.Sc. (Vict.), Ph.D. (Strasburg), 1851 Exhibition Research Scholar, Emmanuel College, Cambridge. Communicated by Professor J. J. THOMSON, F.R.S. Received April 24,—Read May 14, 1903.

(Abstract.)

The object of the experiments described in this paper was to study as systematically as possible the effect of the pressure and nature of the gas with which a metal surface is surrounded upon the magnitude of the photo-electric current from the surface.

On account of the complicated nature of the relation between the photo-electric current and the potential difference between the electrodes, it is not enough to state, for example, that the current in air at 760 mms. pressure is so many times that in air at 50 mms. pressure, without specifying the exact conditions under which the observations were taken. The method used in these experiments was to draw the complete curves connecting the current and the potential difference at each pressure examined, keeping the intensity of the ultra-violet illumination and the other conditions unaltered.

Great difficulty was encountered in finding a suitable source of ultra-violet light which would remain constant in intensity while long series of observations were being taken, but ultimately the spark between iron terminals in an atmosphere of pure dry hydrogen was found to answer excellently. The spark gap was in parallel with three Leyden jars in the secondary circuit of an induction coil, used as a transformer.

The photo-electric currents were measured from a metal—usually zinc—surface placed a few millimetres behind a fine gauze, through which the light passed, and which served as the positive electrode. A brass vessel, with a quartz window to admit the light, served to contain the electrodes. It was connected to pump, gauge, &c., so that the pressure or gas could be changed at will.

A second similar apparatus was used as a control for the intensity of the light.

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Series of curves were obtained, showing the relation between the photo-electric current and the potential at pressures ranging from 760 mm. to 0·0014 mm. They show that at pressures above about 1 mm.—the actual pressure depends on the distance between the electrodes—the current increases at first rapidly with the potential, then less rapidly, and finally, when a certain critical potential gradient has been reached, more rapidly again. No true saturation currents were obtained at these pressures, though the middle portion of the curves were always less steep than the other portions. The currents for the less steep part of the curves increased some twentyfold in value as the pressure was reduced from that of the atmosphere down to a pressure of about 1 mm. Below this pressure the current again decreased, and soon perfect saturation currents were obtained, which became smaller as the pressure was further diminished, though approaching a finite limit.

Curves connecting the potentials and corresponding photo-electric currents in air, carbon dioxide, and hydrogen at various pressures, were also obtained. They show that at the higher pressures the currents in carbon dioxide are about 1·75 times those in hydrogen, and 1·3 times those in air, for corresponding points on the less steep portions of the current potential curves. For the upper part of the curve, when we have ionisation by collision becoming the predominant factor, the relation between the currents is quite altered.

The curves obtained could, however, all be explained on the ionic theory of conduction both qualitatively and quantitatively.

Experiments were also carried out, and the corresponding curves drawn, for the photo-electric currents in carbon monoxide, and for the currents using other electrodes than zinc; the results obtained are given at length in the paper.